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To provide background material for those interested in tele-communication in education and for those planning to implement such programs in their schools, a research study was conducted to gather information from a variety of sources including educational and technical experts, conference participation, visits to schools conducting projects, and the recent literature in the field. The study surveys five aspects of tele-communication beginning with the advantages and utility of television in education. Tele-communication systems such as the standard radio frequency and video distribution systems, microwave distribution systems, 2500 megacycle television, and dial access systems are discussed. Alternatives such as audio learning laboratories, telelectures, films, various still projection techniques, and audio-visual-tutorial systems are considered. Some problems in planning and implementing a system are detailed, and approaches to solving them are proposed. Finally, the types of available research data and some of the potentials for future tele-communication use are surveyed. Extensive appendices list current television projects, equipment manufacturers, organizations associated with educational television, consultants and experts in the field, basic equipment and costs, and several bibliographies. This material was developed under a Title III/ESEA grant. (MT)

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TECHNICAL REPORT
ON
TELE-COMMUNICATIONS

San Mateo County PACE Center
555 Veterans Boulevard
Redwood City, California

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TECHNICAL REPORT ON TELE-COMMUNICATIONS

Purpose

The information presented here has been abstracted from research data gathered by the San Mateo County PACE Center in the process of preparing a Title III, ESEA application for a high school tele-communications project. This report is being disseminated in the hope that it will provide general background material to anyone interested in the role of tele-communications in education and will give a headstart to those planning to implement related programs in their schools. It is not meant to be a conclusive account, as experiences in this field are diverse and much of the vast supply of available data still needs to be researched. It should be considered rather as a summary of one set of research findings which contains data relevant to the planning of tele-communications programs in general. The information was obtained from consultation with educational and technical experts, conference participation, visits to schools which are operating projects of this type, and a survey of research studies and up-to-date literature in audio-visual and educational journals. For greater detail, particularly in the technical areas, it is recommended that the reader consult the attached bibliographies and lists of resource persons and organizations.

TECHNICAL REPORT ON TELE-COMMUNICATIONS

Section I

Advantages & Uses of Tele-communications in Education

In recent years Marshall McLuhan and others have advocated introducing a variety of technological media into our experience, particularly into our educational institutions which he and others claim to be "19th Century environments....where information is scarce but ordered and structured by fragmented, classified patterns, subjects, and schedules." McLuhan suggests that "media by altering the environment, evokes in us unique ratios of sense perceptions. The extension of any one sense alters the way we think and act -- the way we perceive the world." And "when these ratios change, men change".(60) His suggestions, however, and those of progressive educators, have often been met with reactions of fear on the part of teachers at having to change and at the prospect of using complex technological equipment. At the other end of the scale, over-enthusiasm with new equipment and insufficient planning has often led to discouragement or failure. In spite of these reactions, however, a survey of schools across the Nation (see appendix) indicates that utilization of audiovisual and, particularly, tele-communications media is diverse, and specialists in the field are predicting rapid and more creative expansion of these uses in the near future (see Section V).

The wide gamut of tele-communications can be generally categorized into:

1. Use as a supplementary teaching aid -- lessons are presented once or twice a week by an expert to augment classroom offerings,

2. Direct teaching by television -- the major part of a course of study is presented by the T.V. teacher,

3. Television as enrichment -- programs designed to capture outstanding local resources and talent may become available to the classroom for a short period of time,

4. Television as total teaching -- an entire course is taught over T.V., without assistance from classroom teachers (generally, at the college level).

5. Television on commercial and educational stations -- excellent drama, public affairs programs, fine music, and documentaries could be viewed by students during out-of-school hours or, if tapes can be obtained, integrated into course curricula during school.

Lester Asheim's "Survey of Informed Opinion on TV's Future Place in Education"(5) showed that many experts feel that television has been found to be most effective as an enrichment tool and that entire courses cannot be taught well by this method.* Others, looking to the future, see a drift toward its use as direct teaching, rather than just enrichment.** There does, however, seem to be quite general consensus that tele-communications can effectively be used for demonstration purposes, for general orientation and background information, and for any phase of instruction where perception is involved.

County-wide utilization of CCTV, such as in Washington County, Maryland(96), has indicated that the use of television can be applicable to almost any subject. And our research has indicated that it is being utilized at the elementary, secondary, and college level.

Wilbur Schramm, Director of the Institute for Communication Research at Stanford University, assembled 393 cases in which ITV had been compared with regular classroom teaching. He found that some subject matters -- specifically those involving the demonstration techniques -- have apparently been taught more effectively than others. Math and science have been most successful along with social studies, language skills, and health and safety. History, humanities, and literature, which usually require classroom discussion, were not as successfully taught via TV(79). Raymond Wyman suggests that the use of tele-communications is most effective for large group presentations and individual study, with small groups better using their time for discussion(103).

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* This view was held by Paul Witty, School of Education, Northwestern University, and Robert Diamond, Director of Instructional Resources, University College, University of Miami

** Lee Campion, Associate Director, Technological Development Project, NEA.

One recent use for tele-communications is in vocational education classes where students gain experiences from operating the tele-communications equipment themselves. Training in the operating and maintenance of TV equipment was most unusual at the secondary level until recently when several high schools across the country* began to take their key from the vocational junior college programs and to experiment in the use of students as camera operators, program directors, lighting technicians, etc. Morse High School in San Diego, California, has initiated a course in audio/video electronic communications operations. Students work in a studio equipped with cameras, video monitors, film projectors, audio tape recorders, distribution cable systems,and studio stage and lighting equipment, working towards FCC licensing which qualifies them for installation and maintenance jobs in radio and television systems. Instructors in the program have noted an increased interest in learning on the part of youths who had been potential dropouts.(42)

R. Stafford North, Dean of Instruction at Oklahoma Christian College, points out that some have been slow to accept incorporation of the new technology into education on the grounds that it removes the necessary personal bond needed between a teacher and his students. He suggests that TC media are capable of making teaching more, not less, personal, and that if television does not itself provide the face-to-face contact that is essential, the savings from using this time-saving technique are making it possible for teachers to channel their time into the more personal learning situations. North suggests that the basic content of a course is covered by TV presentations, the teachers can devote other class periods to discussion, individual comments by students, and giving individual attention to those students having difficulty with classroom work and those working on independent study projects. With greater access to audiovisual media, the teacher can provide more individual variations of material for different interests and levels of his students.(70)

According to the TV Advisory Panel of the U.S. Office of Education (93), more effective communication methods of this type, utilizing a variety of media, can motivate students, guide and sharpen their reading by providing background and demonstrations, encourage responsibility for independent study, arouse curiosity, and develop new insights and interests. Administrators at the Bedford-Mt. Kisco, New York School District (84) feel that the use of tele-communications media might be a way to reach the non-verbally oriented student. The gifted student would have more materials at his disposal to keep him interested and to let him work at his own advanced level by the supplementation of special projects; the transfer or recently-absent pupil would have an opportunity to make up work by privately listening to tapes; and the average student would receive individual attention and enriched experiences in and out of the classroom. With TV improving classroom teaching and demonstrations and providing self-instructional materials which can conduct drill expertly, the student is given the freedom to work at his own rate.

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* Plainedge Jr. - Sr. High School, Long Island, New York;
Cupertino High School, Fremont, California;
Northern Highlands Regional High School, Allendale, New Jersey

The USOE TV Advisory Panel points out that the teacher, too, will be faced with a new challenge: to put more flexibility and creativity into his teaching as he is required to meet individual interests, needs, and problems of students and to encourage them in their individual learning experiences. If he is using commercially-made programs, as he is likely to do in the beginning, he will have at his disposal a number of specialists, making him a learner along with his students; if he himself is making a tape or teaching live via TV, he will gain experience in a different type of teaching, utilizing different methodology (93).

Lester Asheim (5) points out that just as the student can be motivated by the introduction of the new media, teachers, too, can motivate each other as they use new techniques and become more specialized in their content; much learning can occur from one teacher's observing another's presentation.

In addition to directly gaining from TV in the classroom, the student- and tenure-teacher can use portable videotape recorders for self-assessment purposes. Several teacher-training programs provide teachers with the opportunity to observe their own performances and methods, simultaneously observing student response to their presentations.*

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* Among them: San Jose State College, California
STEP (Student-Teacher Education Program) in
Sausalito, Calif. (under the auspices of
San Francisco State College)

Clifford Erickson feels that for administrators TV offers many new ways to reorganize entire educational programs -- ideas for regrouping of students and teachers, reallocation of space, and more efficient use of time blocks. It spurs the re-evaluation of student needs and objectives and wide cooperation between educators in order to share ideas to bring about more flexible and inventive instructional methods. (31)

Catherine Beachley (6) and John Woodward (102) suggest from experience that tele-communications can additionally be utilized for guidance programs, standardized tests, faculty meetings, announcements, important speakers, and programs of current interest to students and teachers. San Jose State College has found TV to be appropriate and effective for pre- and in-service training of teachers in methods, counseling, and in technical subject instruction. Substantial saving in professional time and in school funds has resulted from the implementation of TV testing. Washington County guidance programs increased quantity and quality of guidance information which in turn are increasing the interest of the students. (6)

TECHNICAL REPORT ON TELE-COMMUNICATIONS

Section II

Types of Tele-communication Media

A. Television Systems

When the decision has been made to install a tele-communications system, there are several different types and combinations that a school can use, depending on its individual needs and financial resources. What follows is by no means a comprehensive list of system and equipment alternatives, but merely a summary prepared from the data gained from consultation with industry representatives and reports from schools across the country. It is strongly recommended that interested persons hire consultants for this very technical and significant matter of planning for system installation. A list of manufacturing and installation companies and a list of contacts are provided in the appendices.

According to Jerrold Kemp, Coordinator of Materials Preparation Services at San Jose State College (44), the selection of TV over other instructional media, will depend in large part on the availability of qualified personnel -- those to work with student groups from the viewing end, those in charge of the small discussion groups, those responsible for the individual study activities, and those who must plan and operate the TV studio. In other situations the successful use of TV may depend on the availability of individuals in a group to work together in the planning and operational phases of a program.

It will also depend on the difficulties of scheduling personnel and facilities and of setting up equipment, demonstrations, or other parts of the lesson. Kemp feels that the interrelations among media will become apparent in connection with scheduling difficulties. If the number of distribution channels is limited and multiple programs on tape must be replayed, it might be desirable to convert a tape-recorded program into a motion picture film, thereby releasing videotape for re-use. A film and projector in a classroom would also provide more flexibility than TV transmission.

Kemp believes that if the audience consists of a number of classes meeting simultaneously in different rooms, the efficiency of instruction by television is undeniable, but that it does not make financial sense to put a lesson television unless that lesson reaches a minimum of 200 to 250 people. If the groups will meet at different times, he recommends that the value of repeated telecasting must be balanced against repeated "in person" classroom presentations.

The following data has been excerpted from Gaither Lee Martin's, "Planning for Television: From Objectives to Equipment" (56):

The two types of closed-circuit television distribution systems in most common use are radio frequency (RF) and video. A third is microwave distribution.

RF Distribution Systems are used in the majority of educational closed-circuit TV installations. Advantages of RF systems (on cable) are:

1. Multichannel capability (all standard television VHF channels -- 2-13 -- may be utilized),

2. Extension of the system whenever new facilities or locations are designated (special splitters added to main trunk lines to extend feeder lines to new locations),

3. Use of both economical standard home receivers and special school receivers.

The flexibility of RF distribution systems is reflected in the fact that several open-circuit broadcasts and one or more closed-circuit programs initiated within the school may be simultaneously transmitted over the same system. The several-channel capability in standard RF systems thus vastly increases the potential applications of TV.

Video Distribution Systems also use coaxial cable to carry the video signal directly from TV cameras to a special video receiver called a monitor. Video systems are superior to RF systems in that:

1. Picture quality and definition are high.

2. Less amplification is necessary to maintain high signal levels.

Microwave Distribution is a point-to-point signal transmission system for picture and sound requiring FCC licensing. It may be used in conjunction with ground, building, or district-wide distribution systems where it is impractical to make cable runs because relatively long airline distances are involved. It is often used in conjunction with standard broadcast station transmitter operations, but seems impractical for most local school uses.

Intercommunication Systems are used to provide two-way talking facilities between TV origination points and reception points. In CCTV systems, it is desirable to pull multipair audio cable along with coaxial cable when the distribution system is installed. This facility is inexpensive, requires minimal service, and permits conversations between any points on the distribution system. If video distribution is used and sound is to accompany TV pictures, then audio lines must be installed in addition to lines for separate technical or instructional conversation.

2500 Megacycle TV

Aware that the shortage of TV channels was increasing, the FCC attempted to break the bottleneck by establishing ITV fixed service -- now known as 2500 megacycle TV. It provides a means for the electronic transmission of images of instructional materials, lessons, information, and other applications for school use on channels other than those regularly employed for noncommercial educational telecasting. These activities are carried on through the use of 31 channels in the 2500-2690 megacycle band. Up to 5 channels may be authorized for use by each licensee. This policy helps alleviate the major problem of providing adequate channel space, and is also capable of relaying programs from other UHF and VHF television channels no longer available in many geographic locations. According to the FCC, the primary purpose of the new service is to transmit visual and accompanying aerial instructional material to selected receiving locations in public and private schools, colleges, and universities, and other instructional centers for the formal education of students. The FCC carefully controls how the system may be used -- but their purposes are being steadily broadened. Costs of 2500 megacycle TV transmission equipment are low when compared with those of conventional open circuit broadcasting. According to Philip Lewis (55), a channel may be put on the air for as little as $25,000 to $35,000. Optimum service radius varies from 5 to 20 miles from the location of the transmitting antenna.

Video-tape Record-Playback Units:

According to Philip Lewis (54), the major barrier to the success of educational and instructional television has been the nature of broadcast or closed-circuit programming which requires that all classes or interested groups view a particular program at a specific time. Investments of video equipment could only be afforded by commercial stations, large ETV stations, and a few major universities. Since that time, a variety of lightweight, transistorized and miniturized units have become available. A combination of CCTV, monitor, and tape recorder makes it possible to record simultaneously both sight and sound on magnetic tape, requiring no further processing for immediate playback. Lack of standardization still exists and may hamper the interchange of prerecorded tapes among libraries, schools, resource depositories, and users of all kinds. But some manufacturers now guarantee interchangeability of recorded tapes between identical models of their products. This compatibility of machines is not available from all producers, and the buyer must be extremely careful when considering interchanging of tapes.

Lewis, quoting 1967 figures, suggests that compact video tape recorders are available in three piece groups:

1. $10,000 to $15,000 category of equipment, suitable for high quality closed-circuit work on on-the-air broadcasting.

2. Moderately priced at about $4,000 - producing good quality images, some of which are suitable for broadcast applications.

3. Low priced in the range of $1,000 to $1,200, suitable for relatively simple closed-circuit functions such as local use with a classroom whenever relatively low definition characteristics are acceptable.

He points out that some machines are adapted for slow motion and stop motion reproduction, whereas others do not incorporate these features. Other factors influencing the cost are:

1. Number of hours that the recording and playback heads can perform satisfactorily before replacement or maintenance is required.

2. Technician time required in replacement and alignment of heads.

3. Tape handling characteristics that determine the life of a video tape.

4. Head cleaning function. Check to determine the required frequency of cleaning as well as the complexity of the job.

5. Width of magnetic tape employed on the machines (1" & ½" most popular). Quality of the reproduced image depends substantially on the area and speed at which the tape is drawn across the head by the vtr. As the tape becomes narrower, the speed at which it is pulled is generally increased to compensate.

Placing of videotape record-playback units in each school, circulation of videotapes, and letting individual schools schedule and originate their own TV programming has been estimated by the Los Alamos, New Mexico district as a saving of 40% over the cost of microwave network and a 50% saving over a coaxial cable installation.

The Lafayette, California, and other school systems have used video equipment to facilitate commercial programs of special interest to be taped and played back to the classroom to fit the lesson. Teachers with special knowledge have taped themselves for playback not only to their own classes, but to other classrooms and for their own viewing. Live programming, image magnification, teacher information tapes, and video specials have also been successful.

Mobile TV Studios:

The increasing use of educational and instructional TV, along with the reduced price of video recorders, has encouraged several school systems to invest in two main varieties of mobile studios -- one where the mobile studio includes complete studio facilities with lighting, cameras, audio pickup, etc. and a control room section for switching, fading the introduction of slides and other graphics and related functions; and a second smaller mobile approach in which the trailor is equipped to contain the recording and control equipment only, with the camera pickup done externally (62).

Dial Access:

One of the newest tele-communication systems, and one which has been receiving much publicity, is the Dial-Access Information Retrieval System, which is, in effect, an individualization of the television picture tube. According to Donald Stewart (85), theoretically, a student can dial a number and through his telephone or TV receiver, he may listen to a lecture, view a film, read a research article from a professional journal, acquire a skill, obtain the latest information about his career field, or learn a foreign language. This facility combined with independent study materials (directed study guides, correspondence instruction, programmed instruction, lab kits, etc.) enable a major part of his educational activities to take place outside the classroom.

Thus shortages of classrooms can be decreased by reducing the need for classrooms, yet the need for teachers would not be reduced by the same proportion because they would be needed to increase the independent study materials. The DAIRS could also make a significant contribution to the resolution of the problem of obsolescence, making assessable up-to-date information and spreading the talents of experts in every field. And for the student, the obvious advantage is the opportunity for individualized instruction, independent study, and the teaching of more diverse problem-solving techniques. The slow learner can review on his own time; the transfer student can view films and video tapes that help him to catch up to the class presentations, and the gifted student can go beyond reading references and collateral material to the vast resources of knowledge to be obtained through the newer technology of instructional systems. Types of DAIRS are usually one of the following four:

1. Scheduled access: The stored audio and/or video programs are played back into the system at specific periodic intervals regardless of whether or not there are any students connected to the program.

2. Non-private limited random access: The stored audio and/or video programs can be cued for playback into the system on a random basis except when the program is already in the process of being played back, even then there is still random access to the program but not to the beginning of the program.

3. Private limited random access: The stored audio and/or video programs can be played back to a single receiving station on a random basis except when the program is already in the process of being played back.

4. Private random access: The stored audio and/or video program can be played back to a single receiving station on a complete random basis.

Generally, systems offering scheduled access and/or non-private limited random access are priced much lower than systems offering private limited random access which in turn are less expensive than systems offering complete private random access.

If relatively large numbers of students will want access to specific programs, it is better to place these programs on a scheduled access basis according to Stewart (86).

If relatively few students will want access to specific programs, it is better to place these programs on a random access basis. The frequency of retrieval will dictate whether private limited random access or private random access should be used. If the frequency of retrieval is especially low, it may be better to utilize a library of tapes so that the requested tapes can be placed into the dial-access system manually or issued in cartridges for use in individual recorders.

Scheduled access permits the use of multi-track recorders which is an additional economy gained in scheduled access systems.

Private random access can best be obtained from systems utilizing some type of master program recorders (which could be multi-track) and slave or buffer units upon which requested programs are automatically dubbed at high speed. The learner is then connected to the buffer unit while the master recorder is released for other dial signals.

Stewart (86) also suggests that present systems are manually operated (by dialing or telephoning) thereby causing a time lag between the time an order is placed and the actual presentation. An expanded system will need a computer to operate it effectively. Electronic engineers claim the day is not too far off when all material may be recorded on discs, and a giant "juke box computer" will make even television recordings available within 10 seconds of ordering.

Receiving stations could be located on the site of the educational institution in classroom buildings, study halls, dormitories, libraries, student unions, etc. They could also be located off the site of educational institutions in private dormitories, homes, or in small learning centers in remote urban areas to facilitate the necessary learning activities of students who otherwise would have to use some of their limited learning time for commuting back and forth to the main campus. For individual use, the equipment could be in individual study carrels, at specially designed open tables, in special rooms, etc. For group use, the equipment could be in large or small classrooms, seminar rooms, etc.

Donald Stewart estimates that the cost of a DAIRS could range from $10,000 to $500,000 or more (87). For the reader who is looking for rough estimates, the price range of a DAIRS installation can be arrived at by using cost figures from $250 to $600 for each receiver location and from $100 to $400 for each program source (audio only). Depending upon the instructional and the technical specifications, cost could exceed or be less than this estimate (1967 figures).

For more specific cost information, Mr. Stewart refers the reader to the DAIRS installation companies listed in the appendix.

The recent development of slow-scan television is a significant breakthrough that should decrease the cost of transmitting visual material in a DAIRS. Images are scanned and transmitted only every 6 or 7 seconds (see lecture installations) and can be transmitted via ordinary telephone lines. Visuals such as photographs, filmstrips, slides, graphs, charts, printed materials, etc., could be shown by this method.

The largest DAIRS used today is the one at Oklahoma Christian College, which allows 870 positions (860 in carrels, three in an auditorium, and the remainder in various office or conference rooms) to access any one of 136 program sources. Thus, each of the 850 students currently enrolled at the college is able to have his own carrel for use at any time between 7 a.m. and 11 p.m.

Section II

Types of Tele-communication Media

B. Alternatives to Television

If the audience is to be composed of a single class, capable of being instructed in one place at one time, then, except in those cases when image magnification or other special effects are desired, Jerrold Kemp (44) suggests that appropriate media other than TV are often preferable. Many of the resources that are normally part of TV production -- careful planning and programming, remotely controlled projectors, rear screen projection -- can serve the students without the expense, remoteness, and problems of TV transmission.

Schools interested in introducing a greater variety of media into their instructional programs, but not yet ready for a completely new system, might consider the creative potential of other audiovisual means -- many of which are already available in schools.

Audio Learning Laboratories

According to Philip Lewis (54), the important functions which can be built-in are: passive listening; audio-active which requires the addition of a microphone to each pair of headsets and permits immediate hearback of whatever the listener says; review which incorporates independent use of the tape recorder-playback unit, either manually or remote-controlled to enable the user to listen, record, and playback the material; multiple-tape duplicating where tape recorders are electronically master-controlled to provide a tape duplicating facility; testing where circuitry permits the student tape recorder-playbacks to be controlled automatically from the teacher console to stop when the master tape is being heard and to start when the student responds to questions and to instructions; intercommunication enabling the instructor to converse with one or more students and students to converse with each other; inclusion of power outlets for each student booth to permit connection of film-strip or slide viewers, portable tape recorders, or teaching machines.

These electronic learning labs were originally designed to serve foreign language instruction, but broader utilization is possible in areas such as speech pronunciation, literature and music appreciation, math drill, typing and shorthand dictation, and other subjects.

Telelecture Installations (Lewis - 54)

Use of telephone circuits to tie-in a lecturer or presenter from a distant point with a school or campus group in a particular classroom or location. The local amplification equipment permits the entire class to hear the presentation and also to ask questions of or make comments to the presenter.

For the cost of the long-distance call plus the equipment and installation charge, more recent developments can add a visual dimension to enhance this approach. With one system a pair of telephone lines carries the audio as in the conventional telelecture while the second pair carries signals that activates a receiver unit to reproduce any drawings or graphics that the lecturer develops in the course of his presentation. The advent of slow-scan television adds a second possibility to telelecture systems. Here, too, ordinary telephone lines transmit video signals which can be reproduced and viewed along with the accompanying verbal presentation of the lecturer. The disadvantage of slow-scan TV is that continuous movements of individuals cannot be transmitted. Rather, images are scanned and transmitted every six or seven seconds. The big advantage, however, is the fact that only ordinary telephone lines are needed, eliminating the necessity to pay the higher rental for coaxial cable.

Motion Picture Projectors and Films (Kemp - 44)

Films are available on every subject and on most grade levels. Two recent developments have increased the effectiveness of films for instructional uses: first, the availability of complete courses on film (principally in sciences and mathematics) some of which originated as TV productions; second, short films that treat a single idea or concept in depth for a specific audience. Eventually, less expensive prints of commercial films may be produced and deposited within an individual school as part of its instructional materials resources.

Overhead Projectors and Transparencies (Kemp - 44)

These offer tremendous potential for improving and increasing classroom communication -- within a small group or within a large class. Difficult concepts may be presented through a step-by-step disclosure or by the addition of overlay sheets to a base transparency. Three dimensional transparent objects, silhouettes, and even simulated motion can be shown. A variety of commercial transparencies are now available, and simple techniques permit local preparation of many types in black and white or in color.

Opaque Projectors (Kemp - 44)

Using the principle of reflected light, materials are projected in their natural color and appearance -- single sheets, mounted pictures, magazine and book illustrations, and all three-dimensional objects. Small drawings and pictures can also be enlarged which can then be traced for other uses.

Tape Recorders and Recordings (Kemp - 44)

Besides being an integral part of electronic lab equipment, these may also serve as aids when preparing reports, conducting interviews, keeping records, self-evaluating presentations, and listening to dramatic and informational programs.

Slide Projectors and Tape Recorder Combinations (Kemp - 44)

Filmstrips or 35 mm slides can be combined with tape recordings, and the two used concurrently. Electronic signaling devices permit automatic changes of slides or filmstrip frames in synchronization with a recording. Permits student-prepared projects as well as carefully designed teacher-made materials to be presented satisfactorily to groups of all sizes and for as many future showings as necessary.

Aids to Self-Instruction (Teaching Machine, Programmed Learning)(Kemp - 44)

These present small increments of information and require active participation by students through overt responses. Programs may be of a variety of types, presented as printed materials in conventional book or workbook form, on films, or by means of various electro-mechanical devices. Value lies in the responsibility that is placed upon the student for learning phases of a subject or a skill by himself, at his own rate, without necessary teacher supervision.

Integrated Multimedia Teacher's Desk (McClendon - 58)

Each teacher's console is equipped with a self-storing folding lectern, an overhead transparency projector, a 2" by 2" slide projector, and an audio tape recorder. Possibly the greatest advantage of the multimedia desk is that it is a self-contained, permanently installed, integral part of teacher's total instructional complex.

A-V-T System (Richason - 77)

Audio-visual tutorial system -- series of independent study booths, each equipped with a tape player and a 35 mm slide projector. Two walls of each booth are made of heavy duty peg board on which charts, maps, and instructions may be displayed. The entire course (lecture and lab) is presented by means of taped discussions and colored slides. The lab work in the AVT system logically and immediately follows the lecture topic, and it thus becomes an integral part of the course, rather than an appendage to it, as is frequently characteristic of the more traditional lecture-discussion-laboratory type of presentation.

Blackboard by Wire (67)

Introduced by Purdue University, it is a teaching system that transmits voice communications and handwriting over telephone lines at a relatively low cost. One hour of CCTV transmission with one-way audio between Los Angeles and New York would cost about $3,700 in comparison with about $900 for a similar transmission via the blackboard-by-wire system. The blackboard-by-wire circuit, utilizing lease telephone lines, also would allow two-way audio transmission.

It enables distinguished scholars and leaders in many fields to present, from a centralized point, illustrated lectures to one or more remote locations anywhere in the country, with any number of TV monitors being utilized for display purposes at each reception site.

The system includes an audio unit and a question indicator panel and microphone which allow the students to ask questions and discuss ideas with the instructor. A light indicator on the desk top signals the instructor when a student wishes to comment or to ask a question.

Laboratories, Resource, and Study Center (Lewis - 50)

Instead of issuing tapes, records, headphones, and so forth, consideration should be given to an electronic network that enables students to have these services via the distribution. Choices must be made between dial-access approaches and intercommunal request systems or a combination of both. Student learning carrels and other spaces should be equipped with power outlets to accomodate current, as well as new, instructional devices such as teaching machines, tape recorders, etc.

Another approach might involve preselected materials on microfiche cards or on data-processing cards with microfilm inserts so that these may be random-accessed for ease of location and use via television.

Section III

Planning

Experience of schools indicates that, in addition to equipment purchase, there are many areas which should be considered in the planning of a tele-communications project. This is especially true of the more complicated systems.

The most serious concerns seen by Robert Diamond (25) during his experience in several schools were:

> Teacher attitudes: "It is apparent that we must not only inform our teachers of the potentials of television, but that we must also help them develop a positive attitude toward exploring the use of the medium within their own classrooms." The in-service training program falls into two distinct parts -- that which takes place in the prospective teacher's undergraduate program, and that which is designed for teachers already in the field.
>
> Equipment vs. Education: "All too often the money that has been made available for a television project has had behind it technological rather than educational orientation. By the time the equipment has been purchased, studio designed, and the technicians hired, there is little money left for curriculum analysis, research, and production. Before rushing ahead to purchase elaborate TV equipment, there are many questions that an administrator must ask. For many school districts a comprehensive studio operation is not practical. Are there alternatives other than television that may be just as effective and far less expensive? Are programs already available from a local or community station that will do the job? What can and cannot be done with television? Does television best fit the particular situation, and, if so, how can it best be utilized?
>
> Trained Personnel: "ITV needs talented, highly skilled personnel with educational backgrounds to assume many of its more important technical roles. If the lessons are to be of the highest quality, the producer, the director, and the visualization specialist (graphic artist-photographer) must understand not only television techniques but also the teaching and learning process. The majority of individuals now involved with instructional television have had to learn by experience, since college programs are only now available, and those entering the field

> from the commercial TV industry are not familiar with educational objectives. As a result, administrators are forced to employ individuals with a minimum of educational experience or to turn to those within the educational field who may have shown no more than a casual interest in the potential of TV. The person proficient in TV techniques must then be given time to learn about education, or the educator entering the instructional television area must have time to visit successful current projects or to take one or more of the few appropriate college courses now being offered. The two organizations offering placement help -- the National Association of Educational Broadcasters (NAEB) and the Department of Audiovisual Instruction of the NEA (DAVI) -- find that they do not have enough specially trained individuals to fill the growing need."

Schools which are now implementing tele-communications programs have, on the basis of identified problem areas, included these components as an indispensable part of their planning process:

1. Scheduling: Altering the scheduling system (of time blocks, student group size, etc.) to best utilize the available media. Problems had been encountered in adjusting the student's schedule to fit the broadcase time, instead of vice-versa.

2. Teacher cooperation: Altering and gaining awareness of new role, attitude, methodology, and time utilization.

3. Curriculum preparation: Planning of course objectives, content, and sequence of telecasts; pre-broadcast and follow-up activities for the classroom use; printed materials to supplement telecasts, etc.

4. In-service training: Training teachers and other personnel for technical and non-technical aspects of the new system.

5. Software development: Adequate supply and sophisticated storing and indexing apparatus, facilitating easy availability.

If the experienced difficulties in installing a telecommunications system can be summarized, it can be said that they all relate in some way to the question of "effective utilization" of the media. The emphasis should be not on the hardware, but on the program, on the instruction. The three most significant aspects of media utilization involve: the administrative role; teacher role and involvement; curriculum and software development.

A. Administrative Role

Program planning components vary from school to school, but all include some provision for physical facilities for transmission and utilization, software, curriculum planning, personnel and talent identification, and training in both studio and utilization areas.

The Educational Facilities Laboratory (23) suggests that apart from the acquisition of hardware, program requirements such as the creative use of space -- for group and individual use, for easy acquisition of software (print and non-print media), for inter-departmental activities, and for production of curriculum materials -- should have considerable priority.

These are examples of schools that have utilized the flexibility of media to the optimum by providing flexible facilities to compliment the innovative use of media:

Nova High School in Fort Lauderdale, Florida has accompanied installation of its dial access system with decentralization of its library services. One resource center has been placed in each of three buildings (language arts, science, and math). Each of the centers houses materials pertinent to the subject area taught in that building. In addition to standard library facilities, every center contains carrels designed for study, typing, audio or television reception. Another unique feature is the beginning of an information retrieval system, which includes a filmsort camera, key-punch, microcard readers, an IBM sorter, and a reader-printer for reprinting microfilms. Students learn at their own rates in an ungraded program, with a computer tailoring each student's program to his need.

Oakland Community College near Detroit, Michigan, also using dial-access, will be virtually without classrooms because of its use of the audiovisual method of programmed instruction. A system which is designed to extend the

the influence of the teacher to a greater number of students. Each student, through the use of a variety of audio-visual learning devices, will proceed with much of his classwork in electronically-equipped carrels. Although a majority of the student's time will be devoted to individual study, the student also works closely with one of the instructors constantly on call near each cluster of carrels. Periodically the student will attend scheduled general assembly sessions; and he will often be involved in evaluation conferences with his instructor or will participate in impromptu seminars with other students. The major academic disciplines have been proposed in the architect's plan as separate buildings centered by a learning resources subcenter serving as a checkout point for most of the college's educational tools. Varied carrel design is also being utilized. Courses will consist of a carefully structured procedure, each step of which is accompanied with a notation which tells the student which type of media to use.

Virginia State College (Norfolk Division) has divided its audio dial-access facilities into three audio labs -- one which is teacher-oriented, one which is teacher-student oriented, and a third which is student-oriented.

Northern Michigan University is working out a proposal to teach parts of high-enrollment courses by closed-circuit television. It advocates dividing such courses into parts, each of which will be taught by the medium most suitable. This systematic approach to teaching will take into consideration the goals of the course, the human and environmental factors involved, the available media and techniques, and the best and most up-to-date knowledge of human learning. Two lectures are to be presented each week on video tape. The two other meetings to be held weekly will not involve the use of TV: one is a laboratory session where students actually work with the scientific approach; the other is a discussion section.

The designing of facilities can be viewed from several vantage points -- population, media, function, etc. -- in order to arrive at a flexible and creative design which aids an innovative tele-communications program.

Raymond Wyman (103) suggests that one solution is to replace the traditional library by combining all books and non-book media into a single instructional materials center (IMC), presided over by a general media person who is equally capable of dealing with all of the media and their utilization. He recommends, however, the more innovative alternative of dividing educational experience into group activities and individual learning and of fitting personnel and service into these areas.

According to Mr. Wyman, the large group of students (from 25 to 100's) is most efficient for the one-way instruction of basic information that a media presentation provides. A group of about a dozen is most efficient for the essential interaction part of education where students are discussing, questioning, debating, proposing, etc. Few, if any, media are used in this part of education. For individual study, audiovisual media are particularly appropriate and have never been as abundant as they are now.

Group presentations and individual study both need hardware and software in order to be effective, and their acquisition, production, storage, maintenance, cataloging, scheduling, operation, and evaluation become substantial operations which can be organized into three service areas:

1. A software or media library that includes all the books, films, slides, strips, recordings, etc. that will be needed in presentations and individual study. These need to be acquired, cataloged, stored, and maintained. Most of all, they need to be available to both students and teachers.

2. A hardware or equipment shop where projectors, previewers, recorders, amplifiers, etc., are acquired, stored, serviced, and ready for loan to a teacher or student.

3. A local production center where recordings, brief movies, slides, transparencies, graphics, booklets, and hand-out sheets can be prepared to answer special needs for media that cannot be satisfied with commercial materials.

Personnel can also fit into these three service areas:

1. The software library can be operated by non-professional people who have been trained in the handling of media. A two-year library training program is the closest thing that presently exists.

2. The hardware within and outside the studio can be best serviced and operated by trained technical personnel who have completed a two-year post-secondary technical program. Presently, these men tend to have either electronic or photographic training.

3. The local production center needs a photographic, graphics, and audio person to operate cameras, duplicators, tape recorders, lettering and drawing devices, etc.

Mr. Wyman suggests that the roles of the traditional librarian and traditional audiovisual specialist should be neither combined nor preserved. But their roles should be expanded in the form of two new types of personnel: a specialist in presentation design and techniques and a specialist in individual study design and techniques.

The presentation specialist would know the contents and capabilities of the software, hardware, and production center and be a co-supervisor of their personnel and activities. He would also know much about projection, lighting, acoustics, group dynamics, and sophisticated presentation techniques. He would work with teachers to make the most effective presentations possible. He would work with administrators on the design of new presentation areas and with curriculum groups on the design of new courses. He would know how to evaluate the outcomes of group instruction.

The specialist in individual study would also know the contents and capabilities of the software, hardware, and production center and be a co-supervisor of their personnel and activities. He would, in addition, be an expert in working with individual students as they search for, select, and use reference books, supplementary texts, films, recordings, slides, newspapers, periodicals, and especially programed materials. He would have particular competencies in choosing carrels and systems to go with them. He would be a sympathetic helper to the student with a problem.

Audiovisual people would most likely move into the presentation area as they learned about producing presentations, group dynamics, research design, room construction, etc. Librarians would most likely move into the individual study area as they learned about newer media used in individual study, carrels, evaluation, guidance, and particularly, programmed instruction.

B. Teacher Role

Dwight Allen (2), speculating on the education of teachers in 1980, suggests that:

> "One focus of attention should be on training teachers as 'directors of education systems'. Whereas the teacher was once the entire instructional system, technological advances and educational theories are making available many educating devices. Given this high-powered support, the teacher will need special training in when and how to use these facilities. As director of a large system, he will have to know the abilities of the students and the potential applications of each of the system components. While technology will have freed him from many instructional responsibilities, he will now take on the new burden of applying systems with intelligence and sensitivity. In this situation, the concept of continuous training becomes imperative as new knowledge develops and new technologies become available."

Experience with a closed-circuit television system made administrators in American Samoa and other schools aware that the teacher's role should become less the traditional one of center-stage transmitting of information and more one of guiding, suggesting, encouraging, and evaluating. Those schools that have experimented with the use of complex systems see as the real barrier to effective utilization not technological difficulties, but the areas of teacher attitude and curriculum preparation. They feel that a "revolution in teacher roles comparable to the revolution in technology and instructional software" is called for. Along with the change in the teacher-student relationship, there is a need for much greater cooperation between teachers, for just as one kind of material (textbooks) has been replaced with multi-media, so is the concept of the multi-purpose teacher quickly being replaced with teachers of many kinds working with each other and with technical and other specialized personnel.

Jerrold Kemp (44) points out that in the traditional teacher-and-thirty-student classroom concept, very little opportunity has been available for the teacher to develop specialties as a presenter of information, as an expert in some phase of his subject area, as a discussion leader, or in guiding skill development of individual students.

Most teachers must be generalists, performing many jobs and filling many roles, some of which they may not be interested in or particularly qualified to perform. This may be especially true in an elementary school where the teacher spends all day with one class, instructing the students in all subjects as well as serving their many other needs.

Instruction to large groups, for the purposes of informing and providing background for discussion and further exploration, requires instructors with one set of skills. Directing small-size groups, which permit face-to-face discussion and teacher-student interaction, requires other qualified teachers. The new instructional patterns providing for individualized learning activities, during which students are directed and encouraged to progress as far as possible at their own rate, involve yet another set of teachers and other staff members.

Kemp also suggests that in such programs, some teachers, specializing in certain subject matter and having the ability to communicate before large groups, serve as presenters. Other individuals, having strengths in leading discussion and working directly with groups of students, are assigned to the small groups, Another team may assist individual students or even work behind the scenes in planning and preparing instructional materials of many types. The special ability of each teacher is thus utilized to the fullest extent.

In addition, staff and technical positions are being filled to assist teachers with many classroom and extraclass routine duties. Teacher aids can relieve classroom teachers of much of the time spent on non-teaching responsibilities. Teachers can thus devote large amounts of their energies and talents to the more creative aspects of teaching, rather than to the mechanical or routine matters.

In well-developed tele-communications programs (Washington County, Philadelphia Public Schools, American Samoa,to name only a few), team-teaching has often been employed as one of the effective ways to use both the classroom and the television to the utmost advantage.

The teacher in the studio and the teachers in the classroom comprise the team. The studio teacher concentrates on preparing his lesson and presenting it with maximum effectiveness. The classroom teacher's task falls into two parts: he prepares the pupils for the TV lesson; and after it is over, he guides them in related follow-up classroom work. It is essential that both studio teacher and classroom teacher recognize and understand each other's responsibilities and that they cooperate with each other. Two different competencies are involved -- preparation for short-period presentation and utilization of this concentrated material in discussion periods -- which hopefully should not cause rivalries and conflicts. (Schramm).

Teaching by television is different from other teaching and will impose a sharper discipline upon method. For the studio teacher, it increases the availability of a variety of devices as teaching aids.

The classroom teacher has not lost his importance, however. A spokesman for the Philadelphia Public Schools points out that "the classroom teacher has emerged as a key entity of the teacher team. Excellent TV lessons are enhanced by skillful handling of pupil questions, lesson extension and application. Pupil learning and attitudes are determined by the skill, enthusiasm, and attitudes of the classroom teacher who must understand thoroughly how to integrate the TV instruction with his own, how to measure learning, and how to supplement the efforts of the TV teacher."

In Washington County, Maryland (96), classroom teachers bear considerable responsibility for the content and effectiveness of television lessons even though they do not present them. The content of each course is planned in workshops and meetings during the summer and throughout the school year, with both studio and classroom teachers participating. When the studio teachers eventually present the lessons on television, all classroom teachers are encouraged to evaluate their effectiveness.

Continuous in-service training, as Dwight Allen points out, is imperative when such large changes are being made, and could greatly facilitate teachers and other personnel in making the transition from the traditional to the more innovative system. Schools have utilized summer vacations and allowed time during the year to deal with the concerns spelled out above, to acquire software, and to prepare new curricula materials. In-service programs vary from school to school from just a few weeks of workshops and discussions involving a few teachers to several years of planning by all faculty members.

C. Planning - Educational Programs and Curriculum Development

Development of educational programs is usually approached in two ways. The often-preferred means is in-house production. Departmental plans for utilizing the tele-communications system are worked out, and individual faculty members, independently of the departmental approach, are also developing materials for use within their own courses and to exchange with other teacher-made tapes. This method, however, must often be deferred until the school is sufficiently reorganized to allow teachers the time required to prepare a television program and until the teachers are themselves in the frame of mind to accept this responsibility. Schools with new programs are effectively using commercially-prepared material -- tapes, films, slides, etc. -- which requires careful acquisition but not preparation. A partial list of companies and schools making material available for purchase or rental is included in the appendix of this report. ETV stations often make their tapes available for a small charge or allow members schools to videotape their programs.

Curriculum development can be undertaken on a course or on a departmental basis with its emphasis dictated by student needs and teacher approach. In a few years more data should be available on which areas of learning can most benefit from the use of the new media. Concerns common to all schools utilizing tele-communications media are the integration of print and non-print media; of live and televised presentations; of large group, small group, and individual activities, etc. As with material development, curriculum planning methods vary according to the school involved. When integrating the televised aspects of the lesson with classroom activities, Washington County Schools found it helpful to think of TV as being effective to present viewpoints, create interests, provide the latest information, dramatize aspects of the lesson, direct attention, pace the learning activities, utilize special talents, enlarge objects, present ideas visually, and bring immediate community and world events into the classroom. Classroom time should be used to express ideas, discuss alternatives, clarify misunderstandings, develop group plans, arrive at decisions, guide pupil growth, make practical applications, provide opportunity for individual and group projects, demonstrate and experiment, test pupil achievement, and evaluate pupil learning.

Section IV

Research Data

Data which pointed out distinct advantages or disadvantages of utilizing television in instruction was difficult to acquire. The most helpful information was derived from visits to and reports from schools that are implementing tele-communication media projects. Almost without exception, these schools have incorporated an "evaluation" component into their programs; consequently, more conclusive data should be available within the next few years. It is recommended that the reader consult the appendix for a list of schools which have on-going tele-communications projects.

Work is being done by the William Hall High School in West Hartford, Connecticut, by the Beverly Hills, California School District, and by other schools utilizing dial-access retrieval systems to:

1. Test the value of utilizing such a system to individualize instruction,
2. Measure changes in student and teacher behavior which occur due to availability of such a system,
3. Compare on a cost effectiveness basis the DAIRS with other methods of audio-visual media distribution,
4. Develop among teachers and other school personnel an awareness of innovations in educational technology,
5. Identify specific skills needed by instructors to utilize effectively information retrieval services and to develop further those skills so that teachers can utilize them in the classroom,
6. Provide a wide variety of supplementary instructional materials to students and teachers,
7. Produce for local and, when appropriate, for national use, instructional materials of all types which are not available commercially.

8. Provide teachers with the skills needed to design appropriate individual study programs utilizing all instructional resources.

In addition to the need for tangible data on the effects of TV instruction on the student and teacher, a number of general needs have been identified by educators as prerequisites to instituting a successful tele-communications program.

1. The need for professional personnel sophisticated in the use of media and positive in their attitudes toward incorporating technology into instruction.

2. The need for pertinent, accurate, and provocative textbooks and audiovisual material.

3. The need for imaginative hardware which is durable, economical, and subservient to the demands of the program.

The chief questions being dealt with by research studies and experienced teachers are:

1. Is there any kind of student who profits more than other kinds of students from instructional TV? Data is muddy, and observations are far from unanimous. Some recent and unpublished research suggests that both the brightest and the slowest students may derive some differential benefit from TV teaching. Teachers often report that the average student benefits equally.

2. Does size of class make any difference in learning from instructional TV? Students generally prefer to be in small classes, but no differential effect of class size on learning from instructional television has been reported.

3. Does TV teaching make any difference in retention of subject matter over a long period? Data remains muddy.

4. Is there a novelty effect in the reported results? A number of studies in school systems and colleges have records of three or more years of experimentation with ITV. These schools report no downward curve of achievement in this time. Many observers feel that the growth in skill at using TV counter-balances the loss of novelty effect.

5. Are we measuring the intangibles? The intangibles most talked about relate to social interaction and individual student differences. There is some question as to whether both these factors are hurt by the one-way nature of televised instruction. As yet, however, no conclusive data have been found to substantiate this point.

6. What do we know about the relation of forms of televised teaching to learning?

7. What are the inter-relationships of television teaching, student attitude, and student motivation?

8. What is the effectiveness of various types of television application combined with small-group and self-study learning situations under the direction of the classroom teacher?

9. What combination of techniques and configurations will produce the best results within each and every course?

Wilbur Schramm, Director of the Institute of Communications Research at Stanford University, compiled almost 400 cases in which ITV use was compared to ordinary classroom teaching, and found that much of the research is not in the journals, but exists in the form of mimeographed reports which the Ford Foundation, the Fund for the Advancement of Education, the U.S. Office of Education, and a number of school officials and researchers have made available (80). Rather than reiterate Mr. Schramm's collation of research studies concerning student and teacher attitude towards ITV and the effectiveness of various subject matter taught via television, the reader is referred to Wilbur Schramm's report, "What We Know About Learning from Instructional Television," included together with several other excellent reports in Educational Television: The Next Ten Years (Stanford California: Institute for Communication Research, 1962).

Mr. Schramm recommends the following works as being good sources of data, though slightly outdated, in the field of instructional television:

Carpenter, C.R. "Approaches to Promising Areas of Research in the Field of Instructional Television," New Teaching Aids for the American Classroom. Stanford, California: Institute for Communication Research, 1960, pp. 73-94.

Kumata, H. An Inventory of Instructional Television Research. Ann Arbor, Michigan: Educational Television and Radio Center, 1958.

Kumata, H. "A Decade of Teaching by Television." In Schramm, W., ed., The Impact of Educational Television. Urbana, Illinois: University of Illinois Press, 1960, pp. 176-192.

Section V

Potentials

The reader who is curious about long-range predictions about the place of tele-communications media in education might be interested in the following comments made by experts in the field:

Robert Diamond, Director of Instructional Resources at University College, University of Miami, has speculated on the potential of television systems and equipment (25):

1. ITV will become a basic part of our teaching process.
2. The single-room TV camera will become an integral part of the laboratory and large lecture halls and will be handled in much the same way as other audio-visual devices.
3. The use of community or educational TV stations will increase dynamically.
4. The quality of instructional programming will improve while the number of live programs produced by individual educational or community stations will decline.
5. Many school districts will combine the use of the community or educational station with closed or open-circuit operations of their own.
6. Video tape will play an increasingly important and basic role in ITV.
7. The number of statewide and regional educational television networks will increase.

Charles Bowen (9) predicts that:

1. Color television, which has rapidly gained popularity for home-viewing of commerical broadcasts, has great potential for classroom use.
2. Cameras using ultrasonic converters, fiber optics, and character generators promise exciting new educational applications. The traditional group of

students looking through microscopes can profitably be replaced by a TV camera attached to a microscope.

3. Equipment now being developed for other purposes will have educational uses in the future. The teacher of the future will have almost undreamed of resources available to his class at the push of a button or spin of a dial.

According to Lester Asheim's panel of experts, accompanying the increased use of tele-communications media will be overall educational change:

More and more, classroom teachers are beginning to recognize that confined teaching (the small class/the single teacher for all subject matters) is going to be eliminated, but at the secondary level it is very likely that a great variety of different groupings will be tried: small classes, large-class presentations, individual uses of TV (especially in lab situations), etc. There is reason to believe, also, that the use of ETV can speed up education: The Washington County Schools has demonstrated that with the help of TV, college math can be introduced at the high school level. The difficulty is that at the moment teachers do not seem to know what to do with the gain: when a class gets ahead of its schedule, the present tendency is to stop to review and otherwise fill up the time until the normal schedule is reached for the next step in the content. ETV might introduce greater flexibility and more imagination into scheduling to take advantage of these gains.

The panel also sees new areas of use for educational television:

If school systems have their own equipment, there will be the use of television in such areas as group guidance, instruction in library use, physical education, driver education, and other such subject matter where extremely large group presentations are feasible and where detailed and close-up demonstrations can be made more effectively than in a large classroom with a live presentation. Distribution of films to individual classrooms via closed-circuit television is an important use. There are likely to be many non-instructional uses of closed-circuit television in the schools: simultaneous availability of a student's record for all teachers involved in a telephone conference; information for students during registration apparent on the television screen, etc.

The influence of television is spreading and will spread further beyond the school and into the community:

Adult Education: Particularly promising are the prospects for meeting the problems of those who are functional illiterate or only slightly better than that. But since an informed electorate requires continuing education after formal schooling is completed, the literate audience is also a target for such programming -- especially those who have not been able to pursue all the formal schooling they might have wished. For many adults the problem of travel time is decisive in determining whether additional schooling can be taken, and television reduces the travel time barrier.

Vocational education for adults also adapts itself well to television instruction. In-service training, especially in business and for mass retraining for automation is a potential field for further development. Informal discussion groups on civic and social issues can very readily be organized around television programs. Cooperation with specific associations concerned about special problems of public interest has great possibilities.

Parent Education: An important field for development of educational television for parents is in those areas where children's habits are really established by parent imposition rather than by the schools -- health, education, increased emphasis on child-rearing, and other content touching upon the parent-child relationship. Open broadcast of actual classroom content is important in that it serves to educate parents, permitting them to see what education does, and to take increasing interest in its quality and content.

Pre-School Education: Reading and other content can be taught via TV so that first graders can begin school with a basic ability already established. But the real potential of pre-school ETV lies in the provision of a background about people, places, and things which would help to equalize experience for all children, including the underprivileged.

Lester Asheim believes that television would serve an important role by:

1. Raising the cultural level of community by providing quality programs in drama, music, etc.

2. Providing a continuing source of learning by offering formal adult education experiences and informal "how-to-do-it" series.

3. Providing accurate information in depth.

4. Helping children to prepare for their first formal school experiences by offering entertaining but valid programs aimed at building attitudes and early skills.

The Washington County School System feels it to be useful for:

1. Providing community (civic) organizations with an effective method for public relations and communication activities.

2. Informing the community about school affairs.

3. Involving parents and community leaders in the development of the school television program.

Although the participants in Asheim's survey held divergent attitudes about the present and future role of tele-communications in education, they concurred on the following predictions for the place of television by 1971:

1. Probably every major school, college, and university will have at least one closed-circuit TV system, and there will not be many school children who will not have had some TV in their educational experience.

2. A wider use of TV in teaching can be expected.

3. ETV will probably reach a plateau very soon, with other technological developments such as the teaching machine appearing to challenge it.

4. Development of the use of ETV to provide teaching and demonstration in specialized subject fields.

5. While there may be some instances of total teaching by TV, the major use of TV will be supplementary. It will be seen as an instructional tool, not as a replacement for good teaching.

6. Some adaptation of the Stoddard Plan of Scheduling will be typical: part of the day utilized in the large television presentation class, and the rest in smaller than usual groups for discussion and socialization. The future will probably see something like 20 minutes out of the hour given to TV at the elementary and secondary levels, and 30 minutes at the college level.

7. One very probably development is the use of closed-circuit television to distribute taped programs which are derived from open-circuit broadcasts.

8. The greatest changes will be apparent in teaching method. ETV will spearhead the movement toward the better use of instructional materials of all kinds with the emphasis on communication. There will be a tendency for ability groupings, greater reliance upon independent study, and the development of responsibility for learning in the learner himself.

9. It is not impossible that as much as 50% of the college degree programs will be available for credit via TV. The traditional insistence on classroom instruction will begin to crumble as the conviction grows that demonstrated mastery of the subject matter should be the criterion no matter how the mastery is acquired.

10. Increasing recognition of superior teaching ability and differential in salaries in school systems will begin to be based on this kind of talents.

11. Airborne TV may already be obsolete with ETV from satellites accomplishing the kind of umbrella coverage airborne TV is now pioneering.

12. School buildings will be much more flexible and adaptable, with portable soundproof partitions and similar features designed with ETV in mind.

13. The wide audience served by regional systems and airborne TV will represent a potential market for better and more carefully chosen textbooks and other materials supporting ETV. Thus, TV could well be an important factor in improving textbook publishing.

"The traditional 50-year lag that presumably occurs between the introduction of a new idea in education and its actual adoption by a majority of the schools, will be much reduced. Thus the 10-year predictions made here are not too unrealistic. But this speedup could be harmful if ETV is rejected too quickly because of wide public exposure of the natural mistakes that occur during a period of experimentation. This could frustrate the best development of the medium. (Asheim).

Appendix 1

TELE-COMMUNICATIONS PROJECTS IN SAN MATEO COUNTY

Thomas Edison Elementary School, Daly City

Participation in PROJECT DISCOVERY, a unique alliance of industry, higher education, and local school districts. Cooperating agencies are: Bell & Howell Company, Encyclopedia Britannica Films, Ohio State University's Bureau of Educational Research, and three schools outside California. The project is designed to test the effect of maximum accessibility and availability of instructional materials on curriculum, pupil attitudes, achievement, creativity, motivation, and teaching methods.

John Belforte, Principal	415/WY 2-1000

Heather Elementary School, San Carlos

Hope to install a complete closed-circuit television system. Presently they have one mobile videotape recorder which, at an individual teacher's request, records ETV programs (San Francisco's KQED) for later replay. TV receiver in almost every classroom.

Cosmo Riviello, Principal	415/591-0797

Bayside Intermediate School, San Mateo

Opportunities for instruction via closed-circuit television system available to 150 top-ability students in the areas of social studies, English, and math. Four rooms, including one large lecture hall, are equipped to receive television. Live lectures given to large groups are videotaped and available for later replay by individuals and small groups.

Gene Hall, Principal	415/345-1224

Parochial School System - Archdiocese of San Francisco

2500 Megahertz four-channel system planned for schools in four counties (Marin, San Francisco, San Mateo, and Santa Clara). Complete cooperation and sharing of materials with public sector agencies has been outlined. Computor services assisting in language and mathematics are planned; data retrieval possibilities seen as good.

Father Bernard A. Cummins, Superintendent of Schools, Archdiocese of San Francisco.

San Mateo Union High School District

The following projects are among those received from district personnel to be submitted for funding for the 1968-69 school year:

1. TV equipment for school-wide program (Mr. Hickson, Capuchino High School)
2. TV Project (Miss Lumpkin, Capuchino High School)
3. Closed-Circuit TV Center (Mr. Ralston, Hillsdale High School)
4. Video Tape for Physical Education (Mr. Sibley, Burlingame High School)
5. Television Instruction for Geometry (Mr. Donley, Hillsdale High School)

NDEA Title III-A is seen as a possible funding source.

Al Mayrhofer, Director of Audiovisual Instruction

Cabrillo Unified School District

As part of the District's IME (Instructional Materials and Equipment) Program, Half Moon Bay High School and Cunha Intermediate School have together purchased Sony video equipment for immediate replay utilization. They plan to apply to the State Closed-Circuit TV Fund for reimbursement.

Appendix 2

TELE-COMMUNICATIONS PROJECTS IN CALIFORNIA

Mission San Jose High School, Fremont Unified School District, Alameda County

Exemplary use of instructional TV

John Macdonald, Principal 657-3600

*Palo Verde Elementary School, Palo Alto Unified School District, Santa Clara County

Videotaping of theatrical productions for self-evaluation and understanding of equipment operation

Fred Seike, TV producer and manager for the District

*San Jose State College

Mobile TV studios

*Lafayette School District, Contra Costa County

Highly sophisticated video tape TV system

Carroll E. Weber, project director of the District's ITV program

Temple City Unified School District

**Instructional Media System: 4½ year program to determine how a typical school district may employ new processes, technology, media, and curriculum to meet pre-identified objectives.

Joseph M. Conte, Project Director 213/285-2111

Linda Elementary School District, Marysville

**Visual Retrieval Reading Center: established to serve students, train teachers and offer social, psychological, and health services. Reading curriculum planned for use in retrieval system; areas to be identified in which the system will support classroom teachers.

Robert Wapple, County Superintendent of Schools, Marysville 916/743-1511

Fremont Union High School District, Santa Clara County

Pioneered Closed-Circuit T.V. with their own broadcasting studio in 1961-62. Initiated at Cupertino High School under the direction of principal George Fernandez, the system has grown to full-fledged operation with full-time program director and technician. Particularly used for science courses.

George Fernandez, Principal 252-7500

Jean Morrison, Director of Audio-visual Education (District) 739-6060

* Additional information available at the PACE Office

** Title III Project

Fullerton High School, Orange County

Working with Orange State College, complete closed-circuit system. May tie in with Anaheim Elementary program. Extensive cabling system (1963 information).

Donald Cruikshank, Principal	871-9000

Raymond E. Denno, A/V Coordinator, Orange State College

Sausalito Elementary Schools, Marin County

Use of video for teacher assessment. San Francisco State College STEP (Student Teacher Education Program), Dr. James Bixler, Director; Phiz Mozzeson, Communications 469-9123

Charles Labaroni, Superintendent	332-3190

*Beverly Hills Unified School District

Data Retrieval System: Retrieves both audio and visual information. Tested in four elementary schools as pilot projects. Data Retrieval System**

Dan M. Gibson, Director of Instructional Materials (for the district) 213/278-1480

*San Diego Unified School District

Instructional T.V. broadcast station developed to serve identified educational, cultural, and informational needs of area. SDA/ITVA (San Diego Area Instructional Television Authority): INSTRUCTIONAL T.V. EDUCATIONAL EXPERIENCE, DEVELOPMENT AND DISTRIBUTION** Locally produced videotaped programs.

Dr. Harmon Kurtz, Special Projects Administrator (District) 714/298-4681

Marysville Joint Unified School District, Yuba County

Reading-learning center using dial-access system. DIAL ACCESS VISUAL RETRIEVAL READING CENTER**

Alvin A. Fodor, Superintendent	916/742-5504

*Fresno School District

Local Instructional T.V. Station** CHALLENGE FOR EXCELLENCE

*Los Angeles County

Seven districts participating including Beverly Hills and Santa Monica. Videotaping used for student self-evaluation and as means of recording professional performances. PROJECT ON THE PERFORMING ARTS**

*Additional information available at the PACE Office
**Title III Project

*Anaheim City School District

CCTV project 1962-63 has been evaluated in an extensive report. Up-dating has taken place since then. Elementary level (grades 4-6)

Mr. James Brier, ITV Director	535-6001

Fontana Unified Schools District, San Bernadino County

Using closed-circuit T.V. for in-service education as well as instruction.

Denzil E. Widel, Superintendent	714/822-8021

Fair Oaks Elementary School, Mt. Diablo Unified School District, Contra Costa County

Integration of closed-circuit T.V. into the 5th grade curriculum.

Walter McClure, Principal	685-4494

Lennox School District, Lennox

Sixth grade lab science courses make use of closed-circuit T.V. which began in 1961.

Los Angeles Junior Colleges

Closed-circuit T.V. unique in that the instructor controls the entire operation of cameras himself by pushbutton. No need for prop men, light, sound, nor camera men; no need for instructor to be bound to script (1959 information)

Chabot College, 25555 Hesperian Blvd. Hayward

Remote dial-access, educational T.V., 80 stations -- access to scheduling, tapes, films.

Don Donatelli, Division of A.V. Services	782-3000

Orange State College (See previous item on Fullerton City High School)

Sacramento State College

Variety of informal experimental closed-circuit T.V. programs. Microwaving of programs (1963)

Roger L. Walters, Educational T.V. Director

San Jose State College

Camera use in classroom for image magnification. Video-tape presentations (1963)

Mrs. Gaither Lee Martin, Coordinator of T.V. Services

*Additional information available at the PACE Office

**Title III Project

San Francisco State College

Has offered workshop (1963) designed for administrators and teachers as consumers or performers on Instructional T.V. Theory, performance, evaluation were emphasized.

George E. Steiner, Coordinator, Educational T.V.

OTHER COLLEGES AND UNIVERSITIES OFFERING CLOSED-CIRCUIT T.V. COURSES

	Contacts (1963 Information)
Chico State College	Garrett Starmer, Head - T.V. Services
Fresno State College	Edwin Lombard, T.V. Coordinator
Humboldt State College	W.J. Stradley, Director, A.V. Services
Los Angeles State College	James Loper, T.V. Coordinator
San Diego State College	Kenneth K. Jones, Jr., Professor in charge - T.V. Broadcasting
University of California-Davis Campus	Charles Nearing, Coordinator, Instructional T.V.
University of California-Santa Barbara Campus	Gary N. Hess, Head - Instructional T.V.

Appendix 3

TELE-COMMUNICATIONS PROJECTS OUTSIDE CALIFORNIA

Plainedge Junior-Senior High School, Long Island, New York

Closed-circuit T.V. program unique in that the equipment is controlled, operated, and repaired by the students.

Abington High School, Abington, Pennsylvania

Closed-circuit T.V. Dial-access information retrieval system used by almost all departments.

Allan A. Glatthorn, principal

Thomas R. Bowman, Superintendent

*Washington County, Maryland

First large-scale closed-circuit T.V. network in the nation. County-wide. Began in 1956.

Buena Vista High School, Saginaw, Michigan

Closed-circuit T.V.

Superintendent Joseph G. Barr, Director of program

Jefferson County, Kentucky

Closed-circuit T.V. County-wide project.

*Nova High School, Fort Lauderdale, Florida

Dial-access retrieval system consisting of a learning laboratory (50 student stations with selection of 4 different programs for each student; teacher can select from 66 programs) and 24 machines available for other kinds of recording.

*Robert Hall High School, West Hartford, Connecticut

Students may dial any one of 24 programs (8 video and 16 audio) from remote carrels and classrooms distributed throughout the building. In 1969 "new" Hall H.S. Project will commence -- media center transmitting 120 programs (20 video and 100 audio)

Meeker High School, Meeker, Colorado

Telephone amplification system

New York City Parochial Schools

"Shut-in" Program utilizing closed-circuit T.V. and the telephone.

*Additional material available on file at the PACE Office

Oak Park and River High School Project, Oak Park, Illinois

Random access audio retrieval system

American Samoa

Educational T.V. in many schools,Extensive team-teaching

**Los Alamos, New Mexico

Videotape record and playback units; circulation of the tapes foreseen on regional, state, and national basis; originate their own T.V. programming.

John Agee, Director of Audiovisual Education

Fox Lane Middle School, Bedford, N.Y.

Dial access system sponsored by NDEA and New York State Education Department. Two-year program of inservice education for teachers.

Thomas Sobol, Director of Instruction, Bedford-Mt. Kisco Public Schools

East Detroit, Michigan Public Schools

Dial access system

Lewis Saks, Supervisor of AV Department

Colleges and Universities

Oakland Community College, Bloomfield Hills, Michigan

Attempting to automate and individualize instruction by dial access program.

*Virginia State College, Norfolk Division

Dial-access retrieval system -- audio only

*Oral Roberts University, Tulsa, Oklahoma

Dial-access audio-video system

*Oklahoma Christian College

Largest dial-access system being used in instruction today -- 870 positions give access to any of 136 program sources

*Grand Valley State College, College Landing, Allendale, Michigan

Dial-access integrated audio-video system

*Additional material available on file at the PACE Office
**Title III Project

Appendix 4

MANUFACTURERS OF TELE-COMMUNICATIONS EQUIPMENT

Manufacturers of Telecasting Equipment

Adler Electronics, Inc.
New Rochelle, New York

Ampex Corporation
Redwood City, California

*Blonder-Tongue Laboratories, Inc.
Newark, New Jersey

*Dage Television (Div. of Thompson Ramo Wooldridge, Inc.)
Michigan City, Indiana

*Allen B. DuMont Laboratories, Inc. (International Division)
New York, New York

*Entron, Inc.
Bladensburg, Maryland

Gates Radio Co.
Quincy, Illinois

*General Electric Co. (Technical Products Department)
Syracuse, New York

*General Precision Laboratory, Inc.
Pleasantville, New York

*Jerrold Electronics Corp.
Philadelphia, Pennsylvania

Motorola, Inc.
Chicago, Illinois

*Philco Corporation (Government and Industrial Division)
Philadelphia, Pennsylvania

*Radio Corporation of America (Educational Electronics)
Camden, New Jersey

*Spencer-Kennedy Laboratories, Inc.
Boston, Massachusetts

*Sarkes Tarzian, Inc. (Broadcast Equipment Division)
Bloomington, Indiana

*Closed circuit television system manufacturers

TelePrompter Corporation
New York, New York

Manufacturers of Television Receivers

Admiral Corporation
Chicago 47, Illinois

Conrac, Incorporated
Glendora, California

Allen B. DuMont Laboratories, Inc.
Clifton, New Jersey

General Electric Company
Syracuse, New York

Magnavox Company
Fort Wayne 4, Indiana

*Motorola Inc.
Chicago 51, Illinois

Philco Corporation
Philadelphia 34, Pennsylvania

*Radio Corporation of America (Educational Electronics)
Camden, New Jersey

Sylvania Electric Products, Inc.
New York 19, New York

*Transvision, Inc.
New Rochelle, New York

Westinghouse Electric Corp. (TV Radio Division)

Zenith Radio Corporation
Chicago 39, Illinois

Manufacturers of V.T.R. Equipment and Accessories

Ampex Corporation
401 Broadway
Redwood City, California 94063

*Manufacture television receivers specifically designed for classroom use.

A-V Systems Incorporated
P. O. Box J
Sea Cliff, New York 11579

Concord Electronics Corporation
1935 Armacost Avenue
Los Angeles, California 90025

Dage Television Division, Raytheon Educational Electronics
West 10th Street
Michigan City, Indiana

General Electric, Closed-Circuit Television Business Section
Visual Communication Products Department
Syracuse, New York

MVR Corporation
470 San Antonio Road
Palo Alto, California 94306

North American Philips Company, Inc., Professional Equipment Division
100 East 42nd Street
New York, New York 10017

Radio Corporation of America, Instructional and Scientific Department
S-489, Building 15-5
Camden, New Jersey 08102

Revere-Mincom Division, 3M Company
2501 Hudson Road
St. Paul, Minnesota 55119

Shibaden Corporation of America
58-25 Brooklyn Queens Expressway
Woodside, New York 11377

Sony Corporation of America
580 Fifth Avenue
New York, New York 10036

Wesgrove Electronics, Ltd.
London, England

Westel Company
298 Fuller Street
Redwood City, California 94063

Electronic Teaching Aids

Ampex Corporation
401 Broadway
Redwood City, California

A. B. Dick Company
5700 W. Touhy Avenue
Chicago, Illinois 60648

Eastman Kodak Company
Rochester, New York 14650

International Correspondence Schools
Division of International Textbook Co.
Scranton, Pennsylvania 18515

The Magnavox Co.
2131 Bueter Road
Fort Wayne, Indiana 46804

3M Company
2501 Hudson Street
St. Paul, Minnesota 55119

MVR Corporation
470 San Antonio Road
Palo Alto, California

Panacolor, Inc.
100 E. 42nd Street
New York, New York 10017

Remington Office Systems Division, Sperry Rand
122 E. 42nd Street
New York, New York 10017

Commercial Electronics Division, Sylvania Electric Products Inc.
Bedford, Massachusetts 01730

Weber Costello Company
1900 N. Narragansett Avenue
Chicago, Illinois 60639

Westel Company
298 Fuller
Redwood City, California

The Wurlitzer Company
DeKalb, Illinois 60115

Xerox Corporation
Midtown Tower
Rochester, New York 14604

Suppliers of 2500 m.c. Systems

Electronics, Missiles, and Communications, Inc.
160 E. Third Street
Mount Vernon, New York 10550

Jerrold Electronics Corporation
Distributor Sales Division
401 Walnut Street
Philadelphia, Pennsylvania 19105

Litton Educational Technology Division
Litton Systems, Inc.
580 Winters Avenue
Paramus, New Jersey 07652

Instructional Electronics Department
Radio Corporation of America
Camden, New Jersey 08102

Micro-link Systems
Varian Associates
1375 Akron Street
Copiague, New York 11726

Appendix 5

FIRMS RESPONSIBLE FOR TECHNICAL ASPECTS OF DIAL ACCESS SYSTEM

Beverly Hills School System

Reeves Electronics Corporation of Los Angeles: Engineered system
Harold Kuerschner of U.C.L.A.: Consultant
Dynamair, Inc. of San Diego: Designed switched controlling, automatic distribution of materials
Pacific Telephone Company and Bell Laboratories: Circuitry between campuses

Oklahoma Christian College

North Electric Company of Galion, Ohio: Designed system for switching and playback
C.H. Guernsey Consulting Engineers of Oklahoma City: Writing specifications, analyzing bids, supervising installation
Magnecord Company, Tulsa: Tapedecks

Nova High School

Chest Electronic Labs, Inc., Chester, Connecticut

Robert Hall High School

South New England Telephone Company: Electronic cable network
Continuous Programs, Education, Inc.: General design of system

Grand Valley State College

Chester Electronic Laboratories, Inc., Chester, Connecticut
Blonder-Tongue Laboratories, Newark, New Jersey

Installation and design

Oral Roberts University, Tulsa, Oklahoma

RCA: Prime contractor

Virginia State College (Norfolk Division)

Chester Electronics Laboratories, Chester, Connecticut: Installation and part of planning layout
David L. Shepard, Superintendent of Buildings and Grounds at Virginia State: Planning of layout

Companies That Install Dial Access Information Retrieval Systems

Ampex Corporation
401 Broadway
Redwood City, California 94063
Peter Kim
(415) 367-2011

Automatic Electric Company
Communication Products Division
Northlake, Illinois 60164
Joseph Cieminski, Product Specialist

Chester Electronic Laboratories, Inc.
Chester, Connecticut
David L. Joslow, Executive Vice President
(203) 526-5325

Continuous Progress Education, Inc.
Wilton, Connecticut 06897
Herman Traub
(203) 227-9464

Dage-Bell Corporation
Educational Electronics Division
U. S. Route 12 East
Michigan City, Indiana 46360
Robert Higgins
(219) 874-3251

General Electronics Laboratories, Inc.
1085 Commonwealth Avenue
Boston, Massachusetts 02215
S. P. Aleer, Sales Manager
(617) 783-0460

North Electric Company
Electronetics Division
Galion, Ohio 44833
Norman N. Hockler, Product Manager - Systems

Omnilab
8 South Michigan Avenue, Room 3100
Chicago, Illinois 60603
Albert Flora
(312) 726-6338

Robert C. Merchant Company
P. O. Box 246
Carmel Valley, California 93924
(408) 659-2255

San Diego Engineering, Inc.
8094 Engineer Road
San Diego, California 92111
Roy L. Gilbert, Manager, Marketing
(714) 278-3374

Appendix 6

ORGANIZATIONS ASSOCIATED WITH EDUCATIONAL TELEVISION

Educational Facilities Laboratories, Inc.
477 Madison Avenue, New York 22, New York

A nonprofit organization established by the Ford Foundation. This group was founded to assist American schools and colleges through encouragement of research, experimentation, and dissemination of knowledge pertaining to physical facilities for education.

Federal Communications Commission
New Post Office Building, Washington 25, D. C.

Joint Council on Educational Television
1785 Massachusetts Avenue, N. W., Washington 6, D. C.

Membership in this group consists primarily of various national educational organizations. The JCET is concerned with the reservation and utilization of channels for ETV and represents the educational television movement before the FCC, congressional committees, and other governmental agencies. The JCET also acts as consultant on legal and technical aspects to persons interested in activating educational channels.

Learning Resources Institute
680 Fifth Avenue, New York 19, New York

This group is supported by both private industry and foundation sources. Its basic functions are to arrange for research leading to the production of more effective educational media and to provide schools with the resulting products to improve instruction.

Midwest Council on Airborne Television Instruction
Purdue Research Foundation, Purdue University, Lafayette, Indiana

Composed of a nationally known group of Middle Western educators, this council was formed to implement an experimental project to study the feasibility of transmitting airborne instructional television over a six-state area. In operation, experiments will utilize specially equipped DC-6 aircraft transmitting sources which will circle at 23,000 feet over the north central part of Indiana.

National Association of Educational Broadcasters
14 Gregory Hall, Urbana, Illinois

This group has a membership ranging from educational units owning and operating television and radio stations and institutions producing or operating closed-circuit TV installations, through organizations engaged in promoting educational broadcasting, to firms engaged in the manufacture and sale of equipment. Individuals interested in educational broadcasting are also eligible to join.

National Education Association of the United States
1201 - 16th Street, N. W., Washington, D. C. 20036

The National Education Association represents the largest professional educators group in the nation. Because of its far-flung operations, no attempt is made herein to list its activities in detail. It is important to note, however, that, in addition to its over-all operations, the NEA has a staff TV consultant and includes 30 departments, each designed to serve specialized functions within the educational structure.

Audio-Visual Instruction (A Department of the NEA)
1201 - 16th Street, N. W., Washington, D. C. 20036

The DAVI supplies information on television to other NEA divisions and departments, other organizations, and to individual NEA members, and renders consultant service to regional, state, and local groups. It holds workshops and seminars concerned with the problems facing educational television, aids in research studies and in the reporting of findings and prepares publications and articles relating to television in education.

National Educational Television and Radio Center
10 Columbus Circle, New York 19, New York

Administrative, programming, developmental, station relations, and public relations office.

Associations Concerned with Educational Television---who will cooperate in furnishing both general and specific information regarding institutions using ETV, curriculum coverage, technical data, sources of counsel, etc.:

Electronic Industries Association (EIA)
1721 Desales Street, Washington, D. C.

Fund for the Advancement of Education - The Ford Foundation
477 Madison Avenue, New York 22, New York

U. S. Department of Health, Education and Welfare
Office of Education, Washington, D. C.

The National Center for School and College Television (NCSCT)

A new center for instructional television established at Indiana University to provide schools and colleges with major sources of high-quality instructional television materials.

Three regional exchange centers for instructional television programming:

Eastern Educational Network (EEN) covers the northeastern U. S. from Maine to Washington, D. C.
Midwestern Educational Television (MET) serves the states of Iowa, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin.
Great Plains Regional Instructional Library at the University of Nebraska.

Fund for Adult Education

A branch of the Ford Foundation established to provide the money needed by broadcasters and educators to launch educational television on a full scale.

National Citizens Committee for Educational Television (NCCET)

Contributing Foundations for ETV Undertakings:

Kellogg Foundation
Payne Fund
Alfred P. Sloan Foundation
Filene Foundation
Twentieth Century Fund
Old Dominion Foundation
Arbuckle-Jamison Foundation
Carnegie Corporation

Business and Industrial Groups:

Bell Telephone Company
RCA
Westinghouse Company

Project ARISTOTLE (Annual Review of Information and Symposium on the Technology of Training and Learning and Education)

U. S. Department of Defense-sponsored project which involves a joint effort among representatives from the emerging education technology industry, the Defense Department, the Office of Education, and other interested Federal agencies. Task groups are studying media, educational research; information storage, retrieval, and dissemination; systems approach to education, etc.

In the San Francisco Bay Area:

BRITE (Bay Region Instructional Television for Education)
Dr. Robert Morrill, Executive Secretary

KCSM-TV - College of San Mateo's non-commercial and non-profit educational television broadcasting station (UHF - Channel 14).
Jacob Wiens, Director

Appendix 7

EXPERTS AND POSSIBLE CONSULTANTS IN TELE-COMMUNICATIONS

Dial Access

*Donald Stewart	Texas A & M University
*James Bradner	Oakland Community College
*Ira Singer	West Hartford Public Schools, Assistant Superintendent
R. Stafford North	Oklahoma Christian College, Dean of Instruction
Arthur Lalime	Director, Instructional Materials Center, Darien, Connecticut
Joseph Newbold	Director of Educational Services, Byram Hills, New York

ETV, Video, Other Media

Dr. Philip Lewis	President, Instructional Dynamics, Inc., Chicago Audiovisual Editor, *Nation's Schools* (video, telephone, ETV)
Dr. Robert Diamond	Director of Instructional Resources, University College, University of Miami Formerly: ITV Supervisor, San Jose State College TV Coordinator for the Plainedge Public Schools (Long Island, New York) where students operated all the hardware--1959. (Instructional television - curriculum, equipment, etc.)
*Martha Gable	Philadelphia Public Schools, Director of Radio & TV (Instructional television)
*Dr. Jerrold Kemp	Coordinator of Materials Prepartion Services and Associate Professor of Education, San Jose State (Microstorage technology, alternative media and equipment to television)
Mrs. Gaither Martin	Coordinator of ITV Services, San Jose State (Consultant to area school districts on equipment and facilities)

*Participated in the 1967 DAVI Convention. Their contributions were recorded on tapes which the PACE Center has available.

Appendix 8

FACTORS TO CONSIDER WHEN INSTALLING TELEVISION IN A SCHOOL

(Abstracted from Design for ETV, prepared by Dave Chapman, Inc., Industrial Design for Educational Facilities Laboratory, 1960)

Physical Factors to Consider:

1. Maximum, minimum viewing distance
2. Horizontal viewing angle
3. Shape and square footage of viewing areas
4. Number of viewers which the various viewing areas will accommodate
5. Height of TV image
6. Standards of legibility
7. Other audiovisual equipment being used

Environmental Factors:

1. Acoustics
2. Lighting
3. Ventilation
4. Color (of walls, drapes, etc.)

APPENDIX 9

Basic Equipment List for Vocational Telecommunication Instructional Program, Radio and Television

2	Television cameras, Diamond Model STV-1, @2800	$ 5,600
2	Sets of lenses, 25mm f.1.9) Cannon 50mm f.1.9) 75mm f.1.9) 135mm f.2.8) @210 per set	420
2	Quickset Samson Model #7301 Tripod with elevator @84	168
2	Quickset Samson Dolly Model #7601 @45	90
2	Quickset Samson Pan Head Model #7201 @32	64
1	Switcher Fader Dynair Model VS-121B	1,750
1	Sync Generator Telmation Model TSG2000M	1,000
1	Conrac dual Picture Monitor Twin 8" Model CNB8/2R	595
1	Tektronix Waveform Monitor Model #RM529	1,100
1	Tektronix Television Oscilloscope Model 524AD	1,300
1	Tektronix Oscilloscope Cart Model 500A	100
1	Test Multiburst Signal Generator	1,500
1	Hickok Tube & Transistor Tester Model 6000A	240
1	Simpson Volt-Ohm-Milliameter Model 260-5P	85
1	Heather Vacuum tube Voltmeter #1MW-11	43

4	Kliegl quartz scoops Model 3451 with pipe fasteners	$ 190
4	Kliegl Pantagraph T-V hangers Model 111 T-V	210
6	Kliegl quartz fresnel spotlights Model 3518	420
10	Kliegl grounded connector plugs Model 955G	45
1000'	Rancho Prene 12/3 so 3 wire cable	280
1	12 ckt. lighting board	1,000
	Allowance for wire, cables, fittings, plugs, receptacles, tools, etc.	2,000
1	Microphone, Stand type, Electrovoice, Model 654a	30
2	Microphone, miniature lavalier, Model 649B @31.50	63
2	Studio speakers, Argos Model TX-1 @27	54
1	Turntable, QRK 12C	170
1	Gray Tone Arm	70
1	Atlas Microphone stand MS-25 and DS-10	25
1	Audio control console Gates "Yard"	1,300
1	Wollensak tape recorder Model 1500AV	180
2	Ampex 7500 videotape recorders @4,000	8,000
100	1-hour reels videotape, 1" @60	6,000
	SUBTOTAL	$34,092

To Complete Closed-Circuit System

2	Dynair closed-circuit television transmitter, Model TX-LB, Ch. 3 & 6 @750		$ 1,500
50	RCA Lycium @140		7,000
50	Room Conversions and plugs @43		2,150
50	TV stands or hangers @22		1,100
		SUBTOTAL	$11,750

To add 16mm Motion Picture and 35mm Slide Projection

1	Telemation optical multiplexer Model TMM-203A		$ 1,300
1	16mm motion picture projector Bell & Howell Model 614-EVMS		2,880
1	35mm slide projector Kodak carousel Model EK-700L with 7" lens		235
1	Bell & Howell 4" lens exchange		55
1	General Electric Model TE-22 Transistorized camera		1,350
1	Conrac dual picture monitor twin "8" Model CNB8/2R		595
		SUBTOTAL	$ 6,415

To Complete Portable Recording Unit

2	TV camera, Concord with 10-1 zoom lens and view finder		$ 3,000
2	Service cart, Allied Model SC-2024		50
4	G.E. Mardigras Flood lamps with pic stand @21		84
		SUBTOTAL	$ 3,134

GRAND TOTAL $55,391

Appendix 10

NEWSLETTERS AND PERIODICALS PUBLISHING MATERIALS CONCERNING EDUCATIONAL TELEVISION

American School Board Journal
Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wisconsin

Audio-Visual Communication Review
Department of Audio-Visual Instruction, NEA, 1201 - 16th Street, N. W.
Washington, D. C.

Audio-Visual Instruction
Department of Audio-Visual Instruction, NEA, 1201 - 16th Street, N. W.
Washington, D. C.

Clearing House
205 Lexington Avenue, Sweet Springs, Missouri

Educational Screen & Audio-Visual Guide
Educational Screen, Inc., 2000 N. Lincoln Park West Building, Chicago 14,
Illinois

Educational Television Factsheet
Joint Council on Educational Television, 1785 Massachusetts Avenue, N. W.
Washington, D. C.

Educational Television Newsletter
Committee on Television, American Council on Education, 1785 Massachusetts
Avenue, N. W., Washington, D. C.

Elementary English
National Council of Teachers of English, 704 South Sixth Street, Champaign,
Illinois

Film World & A-V World
Sidale Publishing Co., 672 Lafayette Park Place, Los Angeles, California

Journal of the Audio Engineering Society
Audio Engineering Society, P. O. Box 12, Old Chelsea Station, New York 11,
New York

Journal of the Society of Motion Picture and Television Engineers
Society of Motion Picture and Television Engineers, Inc., 55 West 42nd Street,
New York 36, New York

Modern Language Journal
National Federation of Modern Language Teachers Associations, 7144 Washington
Avenue, St. Louis 30, Missouri

NAEB Journal
14 Gregory Hall, Urbana, Illinois

Nation's Schools
919 Michigan Avenue, Chicago 11, Illinois

Overview
Buttenheim Publishing Corporation, 470 Park Avenue South, New York 16, New York

Scholastic Teacher Edition of Senior Scholastic
Scholastic Magazines, Inc., 33 West 42nd Street, New York 36, New York

School Management
22 W. Putnam Avenue, Greenwich, Connecticut

Teaching Tools
Sidale Publishing Company, 672 S. Lafayette Park Place, Los Angeles 57, California

Appendix 11

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Appendix 12

SELECTED REFERENCES - ANNOTATED BIBLIOGRAPHY

1. Design for ETV: Planning for Schools With Television. New York: Educational Facilities Laboratories, Inc., 1960

   A well-illustrated and designed report showing how to plan new schools or adapt existing schools for teaching by television. Presents the conclusions of nearly one year's study conducted by industrial designers in conjunction with educators, psychologists, architects, engineers, etc. Very helpful appendix material relating to equipment purchase is included.

2. Diamond, Robert M. A Guide to Instructional Television. New York: McGraw Hill Book Company, 1964.

   A comprehensive manual designed to fill the need for a single reference for adminstrators, teachers, and laymen interested in exploring the possible applications of television with a particular school or school system. Included are reports and recommendations by administrators and teachers who have had experience with television application in many forms. The content is primarily non-technical, consisting of a review of the potential of television in a wide variety of situations---particularly at the elementary and secondary school level. Mr. Diamond adds an excellent bibliography and information concerning evaluation and equipment selection.

3. Lewis, Philip. Educational Television Guidebook. New York: McGraw Hill Book Company, 1961.

   Similar in intent to Robert Diamond's volume, this is designed as an introduction to the use of television for educational purposes but is more technical in its orientation. Detailed instructions for administrators and technicians are clearly explained and illustrated. Case studies, full bibliography, a glossary of terms, and a list of helpful organizations are provided.

4. Lewis, Philip. "Audiovisual Management". Monthly column in Nation's Schools magazine.

   Dealing with a different audiovisual medium every month, Mr. Lewis discusses application, costs, and sources of further information. Although several issues have dealt with electronic products other than television, the majority appear to be devoted to some phase of telecommunications systems.

5. Schramm, Wilbur. Educational Television: The Next Ten Years. Stanford, California: Institute for Communication Research, 1962.

A report and summary of major studies on the problems and potential of educational television, conducted under the auspices of the U. S. Office of Education. Leaders in the fields of commercial and educational television provide insights into television's future role in education and into existing problem areas and make recommendations as to the best direction to move from here.

6. Stewart, Donald K. Dial-Access Information Retrieval Systems for Education. DAIRS Newsletter appearing periodically. Seven issues have been published thus far. Readers can obtain these and be put on the mailing list for future issues by contacting: Donald Stewart, Director of SLATE (Systems for Learning by Application of Technology to Education), P. O. Box 456, Westminster, California 92683.

Contains discussion of the status quo of dial-access retrieval systems, schools which are experimenting with their use, research data as to their effectiveness, etc. Provides the reader with announcements of conferences, current related articles in periodicals, and new products.

7. Stewart, Donald K. "The Cost Analysis of Dial-Access Information Retrieval Systems", Audiovisual Instruction, (May, 1967).

Brief but very detailed report of types of dial-access systems, technical components of each, costs, and sources of more detailed information concerning equipment purchase. List of installation companies is included.

8. Trow, William Clark. Teacher and Technology: New Designs for Learning. New York: Appleton-Century-Crofts, 1963.

Presents valuable background for anyone interested in instructional media, not just television. Discusses the relative place of each of the older as well as the newer media in the total instructional program and the different kind of learning experiences resulting from each. Sections dealing with planning for change are particularly valuable.

9. Washington County CCTV Report. Hagerstown, Maryland: Washington County Board of Education, 1964.

The results of a five-year study, The Washington County Closed-Circuit Educational Television Project (1956-61), are described. Implementing the nation's first large-scale closed-circuit television network, the school district had the opportunity to work with television in all major subject areas at all grade levels. A summary of the evaluation results is provided in the report. Stressing the issue of how and what television can contribute to instruction, televion's potential in a wide variety of areas is discussed in addition to mention of teacher role, system requirements such as personnel and cost, and pupil reactions.

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